PATENT SPECIFICATION

Inventors: JOHN HARRISON PARKS and ROLLIN PAUL VAN ZANDT

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COMPLETE SPECIFICATION

Resilient Gear

We, CATERPILLAR TRACTOR CO., a corporation organized and existing under the laws of the State of California, United States of America, of 800 Davis Street, San Leandro, State of California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to resilient couplings and drive members and relates particularly to a resilient drive-gear structure. This invention may be applied to the timing gear train of an internal combustion engine wherein cyclic irregularities develop vibrations, which may result in damage to the drive elements, and particularly to the gear teeth.

The invention may also be applied to the governor drive of an internal combustion engine for the purpose of isolating or damping the governor from the whipping and vibrations developed in the cam shaft and gear train of the engine. Other uses will be apparent from an understanding of the invention as it is described in the following specification. Generally, the gear of this invention comprises a hub member and a toothed ring member mounted for limited relative rotation therewith. Resilient means in the form of a solid arcuate spring is supported at its ends on anchoring means connected with each of said gear members to absorb torsional loads imparted to either of said members.

Many resilient drive gears are known to the art, which utilize radially or tangentially disposed coil springs or resilient material co-acting between separate gear components to absorb torsional loads when one gear member is moved relative to the other. An obvious disadvantage of such constructions is that their application is limited to larger gears, both axial and diametral, which precludes their use in many applications where space is limited.

[Price 3s. 6d.]

An object of this invention is to provide a resilient drive member adapted for use in limited spaces. Another object of this invention is to provide a resilient drive gear whose physical dimensions are substantially the same as that of a standard (non-resilient) gear blank of equal capacity. A further object is to provide a resilient gear in which the resiliency is obtained by one or more solid arcuate springs connected at their opposite ends to relatively rotatable gear parts. Still another object is to provide a resilient spring-like member acting between the gear components wherein the spring deflection results in compressive and tensional distortion counteracting each other on either side of a neutral axis, substantially through the longitudinal center of the spring mass. Further and more specific objects are made apparent in the following specification wherein reference is made to the accompanying drawings.

In the accompanying drawings:

Fig. 1 is an elevational view, partly in section of the gear structure of the present invention with parts removed showing the arrangement of the components thereof and the manner of their function;

Fig. 2 is a view in section taken substantially along the line II—II of Fig. 1;

Referring to the drawings, a gear structure is disclosed as comprising a hub member 11 and a toothed ring member 12, mounted thereon for rotation about a common axis or shaft 15. Hub member 11 has a reduced diameter 13 forming an annular thrust face 14. Toothed member 12 is axially bored to provide a free running fit on the reduced diameter 13 of the hub member. Hub 11 is further provided with a second portion of reduced diameter 21 forming an annular thrust face 22. An end plate 23 keyed to shaft 15 abuts thrust face 22 and a shoulder 24 of member 12 permitting relatively friction-free rotation of members 11 and 23 with respect to member 12. A nut 28 and a washer 29 hold the end plate in place.

A resilient member in the form of a solid

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arcuate spring 32 is retained in a chamber 33 between the hub member 11 and plate 23. Suitable means are provided to support or anchor the ends of the spring 32 to gear members 11 and 12 so that the spring provides the sole torque transmitting drive connection between the respective gear members.

In Fig. 1, spring 32 is disclosed as an arcuate or "C" shaped member having circular enlargements 36 and 37 on its ends. The enlargement 36 nests in a semi-circular seat 38 formed in member 12, while the other enlargement 37 is anchored on a pin 39 projecting from hub member 11 into chamber 33.

Limited rotational movement of hub member 11 relative to ring member 12 is permitted in response to torque loads or cyclic irregularities occuring as for instance in the gear train of an engine. When a torsional load transmitted through the drive shaft 15 is of a greater magnitude than the initial spring preload, the relative position of the gear members will change. This change in position causes the relative anchor positions to change resulting in deflection of spring 32. Because the end 36 of spring 32 is anchored to member 12, the end 37 tends to travel an arc A—A which is described about the center 41 of the seat 38. However, end 37, being retained on pin 39 is urged to travel an arc B—B, thereby compressively loading the spring 32. This phenomenon takes place whether the torque load is applied to member 12 or to member 11; or if the torque applied is in the opposite direction of rotation. A change in relative positions of the anchors 38 and 39 in either direction from normal will cause spring end 37 to travel the arc B—B, thereby compressively stressing the spring in either direction of load application.

An arcuate relief 42 formed in member 12 provides a working range for the end 37 of spring 32. The extremes 42a of relief 42 present positive abutments for spring end 37 in the event of excessive torsional loads to prevent damage to the spring and provide a solid drive for the interval of such excessive loads.

Suitable openings 51 in Fig. 2 may be provided to permit entry of lubricant into chamber 33.

In the disclosed arrangement, torsional shock is absorbed by a resilient member in the form of a curved spring. In flexing a curved spring, the stresses therein are compressive and tensional, counter-acting each other on either side of a neutral axis substantially through the mass center of the curved spring. This theory provides a ratio of maximum spring force to minimum spring mass permitting a great reduction in physical dimensions in a resilient gear structure.

What we claim is:—

1. A gear structure which includes a hub member rotatable about an axis, a toothed ring member mounted for rotation relative to the hub member and forming an annular chamber therewith, an arcuate spring in said chamber extending between substantially diametrically opposed points therein, and pivotal anchor means for both ends of the spring including a circular enlargement integral with said spring, said anchor means being associated with the hub member and with the ring member respectively.

2. A gear structure as claimed in Claim 1, wherein said spring is of solid construction with its ends engaging said pivotal anchor means whereby angular displacement of the relative positions of said anchor means shortens the distance there between and compressively stresses said spring in either direction of displacement from normal.

3. A gear structure as claimed in Claim 1 or 2 wherein said spring acts between said pivotal anchor means whereby the diametral distance between said anchor means is reduced under influence of tangential torsional loads imposed upon either of said members, stressing the spring along a plane substantially through said axis.

4. A gear structure as claimed in Claim 1, 2 or 3 comprising means formed in one of said members adjacent the pivotal anchor means in the other member presenting a solid abutment in response to excessive displacement of the relative anchor means positions caused by peak torsional loads.

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792,330 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

Fig 1

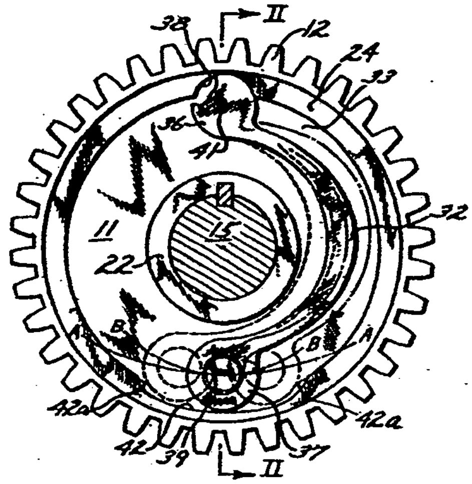
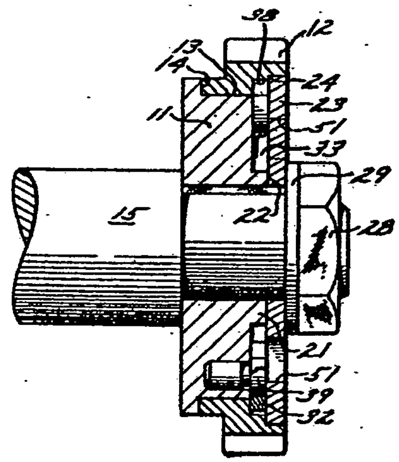


Fig 2



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